

# SAFETY & HEALTH HAZARDS ALERT

Assistant Secretary for Environment, Safety & Health • U.S. Department of Energy • Washington, D.C. 20585

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## Potentially Defective Automatic Fire Sprinklers — An Update

The purpose of this notice is to provide you with an update to previously reported information of a similar nature, published by the Office of Environment, Safety and Health.<sup>1</sup> This notice addresses the recent



**Image of a defective  
Grinnell F-950  
Sprinkler**

automatic fire sprinkler recall issued through the Consumer Products Safety Commission (CPSC), as well as the discovery of conditions that may adversely affect satisfactory performance of certain automatic fire sprinklers. Recommended actions are included. If implemented in your facilities, these actions will help avoid the adverse consequences associated with potentially defective automatic fire sprinklers.

On July 19, 2001, the CPSC announced a voluntary recall of O-ring-type fire sprinklers manufactured by Central Sprinkler Company, Gem Sprinkler Company, and Star Sprinkler Inc. for installations dating as far back as the mid-1970s. A similar recall was announced for 8 million Central Omega brand sprinklers on October 14, 1999, as reported in the January 1999, Safety and Health Hazards Alert. Central Sprinkler, an affiliate of Tyco Fire Products LP of Lansdale, Pennsylvania, will provide free parts and labor to replace 35 million Central fire sprinklers with

O-ring seals, as well as for a limited number of O-ring models sold by Gem Sprinkler Company and Star Sprinkler, Inc.— totaling about 167,000 sprinkler heads.

Central initiated this action because it discovered that the performance of O-ring seals can degrade over time due to either metal corrosion, minerals, salts or other contaminants of installed systems. These factors could cause sprinkler valve caps to seal shut and not activate in the event of a fire. To date, Central has received four reports of “wet” sprinklers failing to activate in a fire and nine similar reports on “dry” sprinklers.

Replacement sprinklers that do not use O-ring seals will be provided for certain types of wet sprinklers installed between 1989-2000 or for dry sprinklers installed from the mid-1970s to 2001. An identification brochure for all the models covered under this voluntary replacement program can be downloaded via the Internet at

<http://www.sprinklerreplacement.com/VRP/whatSprinklers/downloadID.html>.

As a supplement to this recall, please review the January 1999 Safety and Health Hazards Alert addressing issues with other fire sprinkler models that have additional suspect deficiencies and which may continue to be present within your

<sup>1</sup> Environment, Safety and Health Safety & Health Hazards Alert, Issue No.99-1 DOE/EH-0518, January 1999, *Potentially Defective Automatic Fire Sprinklers*.

facilities. One such issue was the inadvertent activation of Grinnell Model F-950 sprinkler heads. The Alert stated: “. . . in a series of incidents beginning in 1987 and culminating in the recent past, the Princeton Plasma Physics Laboratory and the Rocky Flats Environmental Technology Site collectively experienced 11 unexplained activations of Grinnell Model F-950 sprinkler heads in 9 different building areas. The heads were manufactured in 1978.” This issue continues to affect DOE facilities as described in the following events.

On February 23, 2001, a Grinnell F-950 sprinkler head in Building 371 at Rocky Flats inadvertently actuated causing a release of 500 – 1,000 gallons of water that affected Rooms 2221, 2321, and adjacent areas and shorted out a criticality detector.<sup>2</sup> RFO-KHLL-3710PS-2001-0004 also cites another event that occurred on January 12, 2001, in which a Grinnell F-950 sprinkler head in Room 2203 of Building 371 inadvertently caused the release of approximately 40 gallons of water into the room. In addition to these, three other similar events at Rocky Flats have occurred since April 1997 described as follows:

- On April 10, 1997, an F-950 sprinkler inadvertently actuated in Room 1105 of Building 371, releasing an undetermined amount of water.<sup>3</sup>
- On June 12, 1997, an F-950 sprinkler head inadvertently actuated in Room 2022, releasing approximately 2,000 gallons of water.<sup>4</sup>
- On November 9, 2000, an F-950 sprinkler head inadvertently actuated in Room 2201, discharging an estimated 2,000 gallons of water onto the floor and on top of plenum units.<sup>5</sup>

A contractor engineering assessment team of subject matter experts submitted a technical report indicating that the failure rate clearly exceeds normal design expectations. The RFO-KHLL-3710PS-2001-0004 ORPS (Occurrence Reporting and Processing System) report states that a sample of nine unactuated

Grinnell F-950 sprinkler heads taken from throughout the facility was evaluated by Factory Mutual Research Corporation (FMRC) following the first two abnormal failures in 1997. All nine tested heads passed a test described as “an accelerated aging test to determine if the sprinklers are likely to prematurely operate.” In addition to the nine unactuated heads, two heads that had previously actuated inadvertently were sent to FMRC. FMRC evaluated the cause of their inadvertent actuation to be cold flow of the solder, that is, slow separation or creep of the solder. The ORPS report states that cold flow “could occur when the sprinkler was manufactured or while in storage prior to installation. Grinnell F-950 sprinklers manufactured in 1975 and between 1978 and 1982 have had a high number of premature operations, which typically indicate manufacturing defects.”

Specific potential consequences for the Rocky Flats site from these inadvertent actuation events include damage to safety equipment, such as criticality detection systems and life safety disaster warning equipment. In general, such events disrupt operations and are a nuisance.

The latest inadvertent sprinkler actuation reported to ORPS happened at the National Energy Technology Laboratory on May 30, 2001. A Grinnell F-950 discharged in Building 83, Room 318, resulting in significant water damage (\$15,000) to equipment, papers, and materials.<sup>6</sup>

In June 2001, a survey of the DOE fire safety community was conducted via the fire protection Listserv. This survey indicated that similar failures of Grinnell F-950 sprinkler heads have been noted at the Sandia National Laboratories, the Kansas City Plant, and the Paducah Gaseous Diffusion Plant.

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<sup>2</sup> RFO-KHLL-3710PS-2001-0004

<sup>3</sup> RFO-KHLL-3710PS-1997-0031

<sup>4</sup> RFO-KHLL-3710PS-1997-0047

<sup>5</sup> RFO-KHLL-3710PS-2000-0085

In light of the above, the following actions are deemed prudent and should be considered as expeditiously as possible for potentially defective fire sprinklers that have either been addressed by CPSC or past DOE notices:

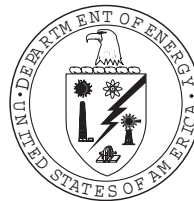
- Consider surveying all facilities protected by automatic sprinklers with the purpose of discovering the presence of any targeted fire sprinklers. It is suggested that all sprinkler make and model types in these facilities be documented, both to locate suspect sprinkler areas and to facilitate any future reliability concerns that may derive from either sprinkler manufacturers or CPSC or DOE. Concerning the Grinnell F-950 sprinkler, surveys should focus on identifying facilities and areas where water damage from inadvertent sprinkler actuation would be most vulnerable, such as nuclear facilities. The results of any survey should be reported to the appropriate DOE program and fire safety officials.
- Where recalled sprinklers are discovered, the process described by the CPSC to obtain replacements should be initiated. DOE contractors and non-contractor DOE field elements should consider interim compensatory activities in high-risk facilities, pending manufacturer replacements of recalled sprinklers.
- Where Grinnell F-950 sprinklers are discovered, the vulnerability and risks associated with the area should be weighed against the cost of replacement. The potential wetting of safety-related instrumentation, controls, or electrical equipment should be given priority evaluations. Pending replacement of sprinklers that are determined to be in highly vulnerable areas, interim compensatory (water damage prevention) measures should be implemented.
- All site fire protection system inspection, testing, and maintenance programs should be reviewed to assure they include routine exterior and interior inspections of sprinkler heads.

- The results of these activities should be shared with other organizations and individuals via the occurrence reporting system, as required, and within the DOE fire safety community via the fire protection Listserv, which is accessible from the DOE Fire Protection Home Page, located at: <http://tis.eh.doe.gov/fire>

## Contact:

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